CHAPTER 6

FORMATTED BINARY BLOCKS

6.1. Product Definition Block. This block shall be an 18 byte block, including the LENGTH and CHECKSUM fields. The specific format and content shall be as shown in Figure 6-1.

6.2. Satellite Product Definition Block. This block shall be a 22 byte block, including the LENGTH and CHECKSUM fields. This block is designed to define data organized by orbit. The specific format and content shall be as shown in Figure 6-6.

6.3. Data Description Block. The Formatted Binary Data Description blocks, (Option 1 and Option 2) shown in Figure 6-2 and in Figure 6-3, act as data interpretation tables for the data in the following binary data block(s). They describe the data in the Formatted Binary Data block(s) in sufficient detail to allow the receiver to use the data. The length of the description blocks shall depend on the number of repeating data sections required to define the product. (See Note 3 for Figure 6-2 or Figure 6-3.)

6.4. Data Block. The Formatted Binary Data block shall be formatted as shown in Figure 6-4. The data field shall be formatted as specified in the Formatted Binary Data Description blocks, Option 1 or Option 2, whichever is appropriate.

6.5. Presentation of Formatted Binary Data. While the data description blocks serve as data interpretation tables for the data block(s) which may follow, there are a number of ways for presentation of element data in the formatted binary data block. Most element data lends itself to numeric (binary) presentation (e.g., temperature, heights, etc.) while other element data lends itself to presentation as ASCII characters (e.g., station ICAO call letters, present weather). Agencies have some flexibility in choosing an element data presentation method and the user of these products needs to be aware of the method or methods being employed. The following are examples of possible implementations.

A. WMO Block and Station Number: The data description block would show two element mnemonics, one for WMO Block Number (BLK) and one for WMO Station Number (STN). These data could be presented in the data block as 2- and 3-byte ASCII characters or as 1- and 2-byte numeric characters. The user can determine the method of presentation by testing on the "Number of Bytes per Element" - byte in the description block.

B. Present Weather: The data description block would show one of the three present weather mnemonics (WW1, WW2, WW3). The data could be presented in the data block as a numeric code value, following the WMO WW numbering scheme (0-99), or as ASCII characters using the accepted meteorological abbreviations (e.g., RW, K, etc.). The numeric presentation can be done in one byte in the data block but the ASCII presentation must be done in three bytes. Once again, the user can determine the method of presentation by testing on the "Number of Bytes per Element" - byte in the data description block.

C. Barometric Characteristic: The data description block would show BC as the element mnemonic. Table A2-2 shows that the data would be reported in ASCII form as BC0 through BC8, corresponding to the nine possible reported code values (0 through 8). This ASCII presentation would require three bytes in the data block. The actual code value of 0 through 8 could also be reported as a one-byte numeric value, scaled with a multiplier of one and additive constant of zero. The USAF has chosen a third method using a special data block data code of 160 through 168 (decimal) numeric (see Table A2-2), which also take one byte in the data block. However, this code is not considered to be a scaled numeric value, therefore, the multiplier mantissa and characteristic and additive constant are all zero. This logic can be used to determine the method of presentation.

D. Cloud Amount: The data description block could show CTA (total cloud amount), L1A - L4A (layer cloud amount), C1A - C3A (layer cloud amount), CLA, CMA, CHA (low, middle, and high cloud amount), or SKY (sky cover). The data could be presented in the data block as a three-character ASCII string (CAM, CLR, SCT, BKN, OVC, OBS, CAO - CA9). The data could also be presented as a one-byte numeric value indicating the eighths or tenths of cloud cover or as a percent of cover, with units code and scaling factor being the discriminator. The USAF has chosen a third method using a special data block data code of 149 through 159 (decimal) numeric (see Table A2-2), which also takes one byte in the data block. As with barometric characteristic, this USAF code is not considered to be a scaled numeric value, therefore, the multiplier mantissa and characteristic and additive constant are all zero.

E. Cloud Type, Past Weather, Ship Direction: The data description block could show CLT, CMT, CHT, CT, C1T, C2T, C3T, L1T - L4T, PWX, SD, or SDD for these elements. The data could be shown in three bytes in the data block as ASCII characters, as listed in Table A2-1. The USAF has chosen special data block data codes, which take one byte in the data block, for reporting the element value (Table

A2-2). As with the other special data block data codes, these codes are not considered to be scaled numeric values so the multiplier mantissas and characteristics and additive constants are all zero.

6.5.1. Formatted Mixed Data. The Formatted Binary Data Description Block, Option 2 (Figure 6-3), has been provided to handle the transfer of Profiler and Profiler-related data among both Government and non-Government agencies. It permits mixed numerical representations (two's complement integer, ASCII, IEEE floating point, etc.) and array lengths within the same data block. This means that a data producer can send header information, data elements, and data arrays; use any defined data representation; and send data in any order.

6.6. Data Sequence Block. The Formatted Binary Sequence Block saves needless repeating of Formatted Binary Data Description Blocks within a mix of types of Formatted Binary Data Blocks.

The Data Sequence Block (Mode 3, Submode 23), Figure 6-5, preceded Data Description Blocks (Mode 3, Submode 21) which precede a repeating mix of types of Data Blocks (Mode 3, Submode 1). The Data Sequence Block describes sequences of Data Blocks which follow matched to the corresponding Data Description Blocks for each type Data Block.

FF	LENGTH (I)	
003	020	
CHARACTER 1	CHARACTER 2	┐Station Call Letters
CHARACTER 3	CHARACTER 4	┘(ICAO)
WMO BLOCK NUMBER (I)		
STATION NUMBER (I)		
LATITUDE I		
LONGITUDE I		
CHECKSUM		

NOTES:

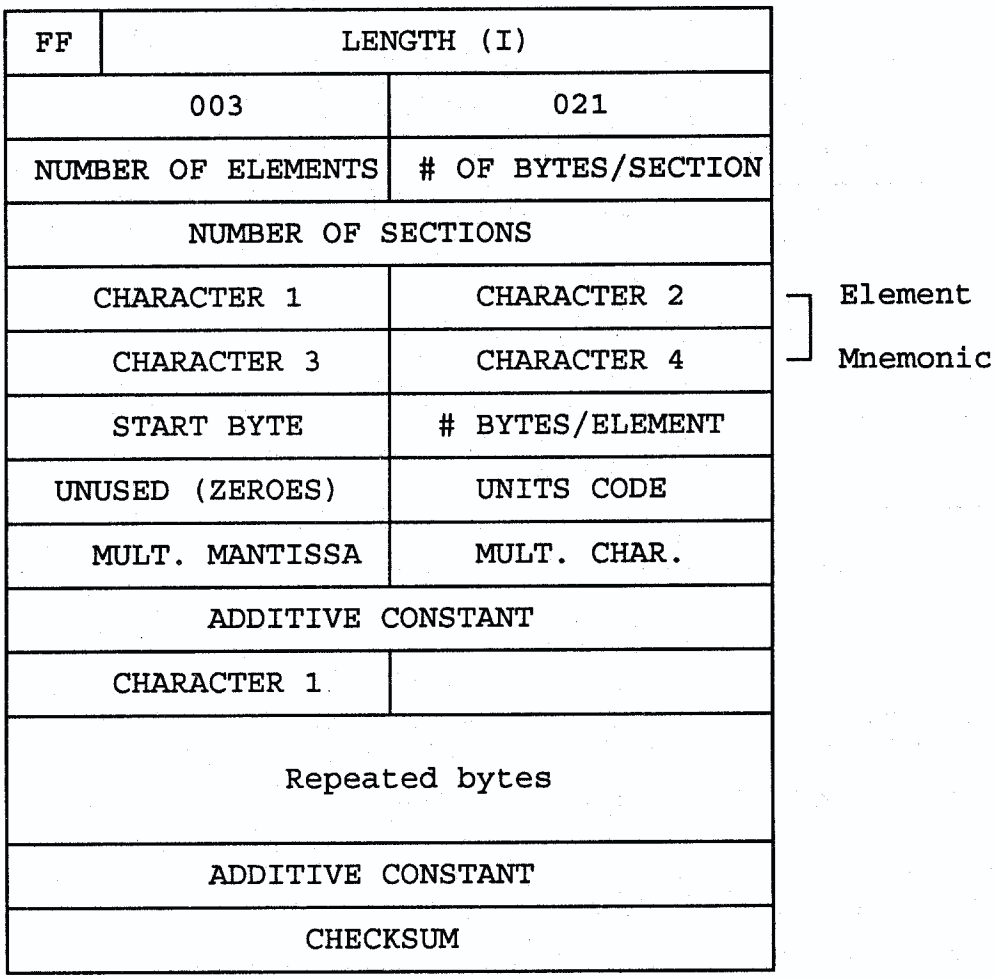
1. Station Call Letters: The International Civil Aviation Organization (ICAO) identification of the originator station.

2. WMO BLOCK NUMBER: A two digit identifier of a section of the earth based on a system developed by the World Meteorological Organization (WMO).

3. STATION NUMBER: A three digit station identification within the region identified by the WMO BLOCK NUMBER.

4. LATITUDE, LONGITUDE I: Latitude and Longitude must be multiplied by .01 to get the actual value. Negative latitude indicates South, negative longitude indicates East.

Figure 6-1 Formatted Binary Product Definition Block; Mode 3, Submode 20



NOTES: This block is also used for unpacked gridded products.

1. NUMBER OF ELEMENTS: The number of elements contained in each section of the data block. This field indicates the number of 12 byte repeating sections in the data description block.

2. NUMBER OF BYTES/SECTION: Total number of bytes contained in a repeating section. This is the number of bytes that must be skipped to read a given element from each repeating section.

3. NUMBER OF SECTIONS: The total number of repeating sections in the data block.

Figure 6-2 Formatted Binary Data Description Block, Option 1; Mode 3, Submode 21

NOTES: Figure 6-2 (con't).

4. ELEMENT MNEMONIC: A character set that identifies the element being described. Tables A2-1 and A2-2 (Appendix A) contain the mnemonics lists.

5. START BYTE: The byte number in the data block where the first occurrence of the element can be found. Succeeding occurrences of the element can be found by successively adding the number of bytes per section to the start byte number.

6. NUMBER OF BYTES/ELEMENT: The number of bytes in the data block occupied by the element.

7. UNITS CODE: A code specifying the units of the data elements. The list of units codes is found in Table C2-4 (Appendix C).

8. MULTIPLIER MANTISSA: Integer constant to be multiplied by the element value to obtain the actual value of the element. Used in conjunction with the multiplier characteristic.

9. MULTIPLIER CHARACTERISTIC: Exponent of 10 to be used with the multiplier mantissa to obtain the true value of the element.

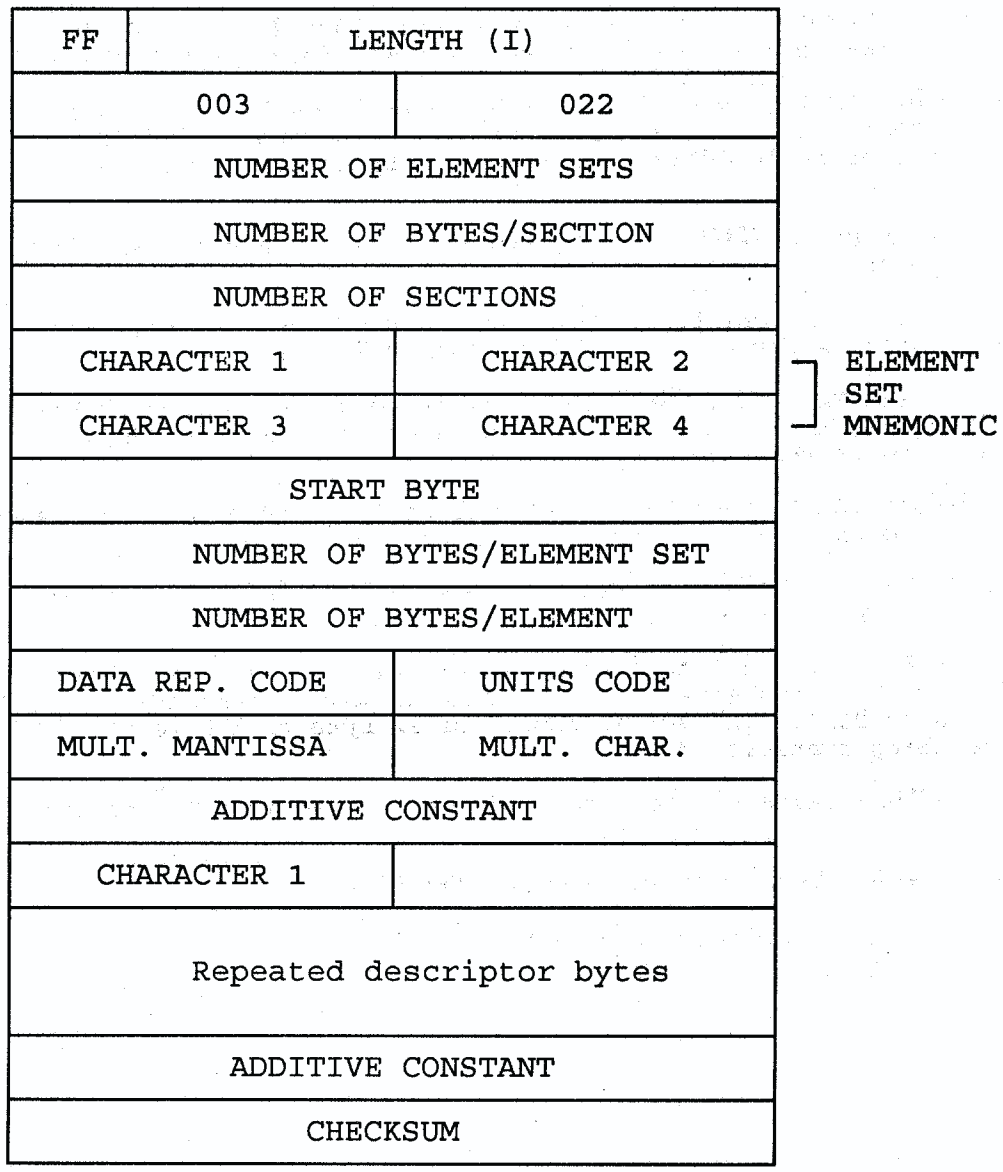
10. ADDITIVE CONSTANT: Integer constant to be added to the element value to obtain the true value of the element.

11. The ninth through twentieth bytes are repeated for each element in the data type being transmitted. These 12 bytes may be repeated for up to 256 parameters (0-255). The actual number of 12 byte fields required depends on the data being transmitted.

12. The actual value of the element is calculated as shown below:

$$\text{Actual Value} = \text{Element Value} * \text{Mult. Mantissa} * 10^{\text{Mult.Char.}} + \text{Additive Constant}$$

Figure 6-2 (Cont.) Formatted Binary Data Description Block, Option 1; Mode 3, Submode 21



NOTES: Figure 6-3: This block is used for formatted mixed data such as two's complement integer, ASCII, IEEE floating point, etc. and array lengths.

1. NUMBER OF ELEMENT SETS: The number of element sets (an element set is either one element or an array of elements) contained in each repeating section of the data block(s). This field indicates the number of 16 byte repeating descriptors in the data description block.

Figure 6-3 Formatted Binary Data Description Block, Option 2; Mode 3, Submode 22

NOTES: Figure 6-3 (Cont.):

2. NUMBER OF BYTES/SECTION: Total number of bytes contained in a repeating section. This is the number of bytes that must be skipped to read the first element of a given element set from each repeating section.

3. NUMBER OF SECTIONS: The total number of repeating sections in the data block(s).

The remaining parts of the data description block are the repeating descriptors described in Note 1.

4. ELEMENT SET MNEMONIC: A four-character set that identifies the element set being described. Tables A2-1 and A2-2 of the reference contain these mnemonics.

5. START BYTE: The byte number in the data block where the first occurrence of the element set can be found. Succeeding occurrences of the element set can be found by successively adding the number of bytes per section to the start byte number.

6. NUMBER OF BYTES/ELEMENT SET: The number of bytes in the data block occupied by the element set.

7. NUMBER OF BYTES/ELEMENT: The number of bytes in the data block occupied by each element of the set. (If this is equal to the NUMBER OF BYTES/ELEMENT SET, then this element is not an array.)

8. DATA REPRESENTATION CODE: A code specifying the representation type of the element. Table C2-5 (Appendix C) lists the codes. Examples of data representation are two's complement integer, Floating point, or ASCII.

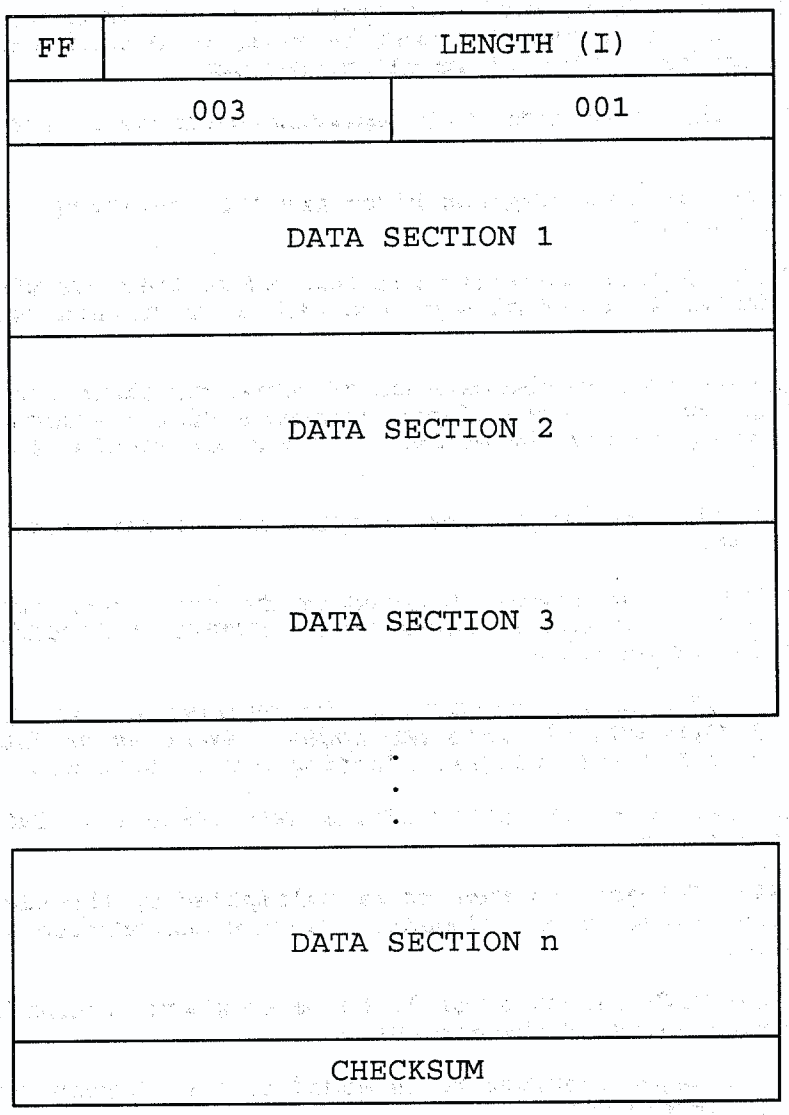
9. UNITS CODE: A code specifying the units of the data elements. Table C2-4 (Appendix C) contains these codes.

10. MULTIPLIER MANTISSA: Integer constant to be multiplied by the element value to.obtain the actual value of the element. Used in conjunction with the multiplier characteristic.

11. MULTIPLIER CHARACTERISTIC: Exponent of 10 to be used with the multiplier mantissa to obtain the true value of the element.

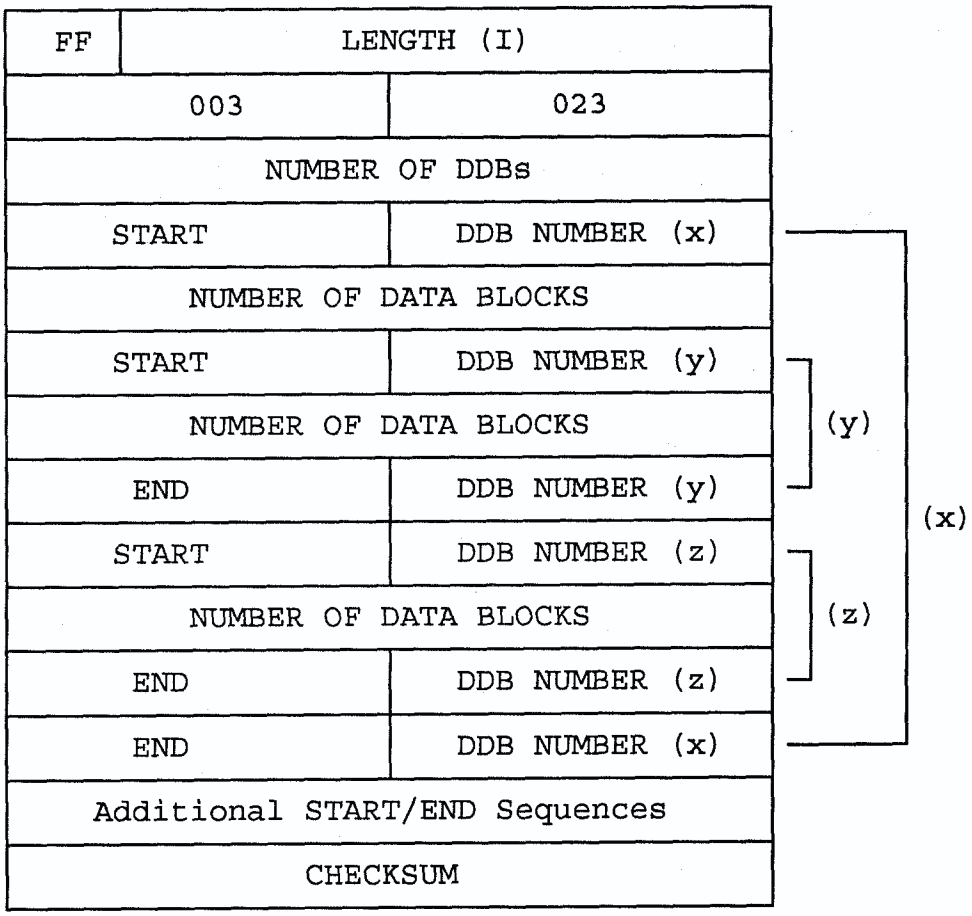
12. ADDITIVE CONSTANT: Integer constant to be added to the element value to obtain the true value of the element.

Figure 6-3 Formatted Binary Data Description Block, Option 2; Mode 3, Submode 22



NOTE: This block is also used for unpacked gridded data.

Figure 6-4 Formatted Binary Data Block; Mode 3, Submode 1



NOTES:

1. NUMBER OF DDBs: The total number of Formatted Binary Data Description Blocks (DDB) (Mode 3, Submode 21) immediately following the Data Sequence Block. (This number also corresponds to the number of Formatted Binary Data Block (Mode 3, Submode 1) types which follow.)

2. START/END: Indicator for DDB sequence start or end. START = 173 (octal) (ASCII left brace). END = 175 (octal) (ASCII right brace). Each START indicator for a sequence (e.g., sequence x, sequence y, etc.) must have a matching END indicator. See Note 1.

3. DDB NUMBER: Relative number identifying this DDB within the total DDB set (e.g., DDB NUMBER two of five. The DDB NUMBER is two; the NUMBER OF DDBs is five).

Figure 6-5. Formatted Binary Sequence Block; Mode 3, Submode 23

NOTES: Figure 6-5 (Cont.)

4. NUMBER OF DATA BLOCKS: The total number of Formatted Binary Data Blocks (Mode 3, Submode 1) included within this sequence (x), (y), (z), etc. The number of data blocks is specified in the NUMBER OF DATA BLOCKS byte pair immediately following the START/DDB NUMBER byte pair for each sequence. The referenced Data Blocks' content correspond to the DDB for this sequence.

5. The START/END sequence is the key to using the Data Sequence Block. Six bytes define each sequence: START (173 octal), DDB NUMBER (x), NUMBER OF DATA BLOCKS, END (175 octal), DDB NUMBER (x). Depending on this six byte ordering for sequences (x), (y), (z), etc., once can describe sequential or nested Data Block repeat patterns. (Describing sequential or nested patterns is like computer program Do Loops.)

6. For example, in Figure 6-5, the START/END sequence (y) and (z) are nested sequentially within START/END sequence (x). Specifically, Figure 6-5 describes sending the first type (x) data block, sequentially followed by a specified number of (y) type data blocks, sequentially followed by a specified number of (z) type data blocks. The data block pattern begins again with the next (x) type data block continuing in the manner previously described until the Data Sequence Block is satisfied. (If desired, and End of Product Block (Mode 1, Submode 2) could immediately terminate the sequence.)

Figure 6-5. (Cont.) Formatted Binary Sequence Block; Mode 3, Submode 23

FF	LENGTH (I)
003	030
SATELLITE SERIES	
SATELLITE ID NUMBER	
START ORBIT 1	START ORBIT 2
START ORBIT 3	START ORBIT 4
END ORBIT NUMBER	
START TIME : DAY OF YEAR	
START TIME:HOUR	START TIME:MINUTE
END TIME:HOUR	END TIME:MINUTE
CHECKSUM	

NOTES:

1. SATELLITE SERIES: Two letter satellite ID in ASCII coded format.

2. SATELLITE ID NUMBER: Two numeric characters in ASCII coded format. This is the numeric code corresponding to SATELLITE SERIES. The following table cross-references SATELLITE SERIES to SATELLITE ID NUMBER:

NOAA SATELLITE SERIES	*Corresponding SATELLITE ID NUMBER*
TN	*01*
NA	*02*
NC	*04*
NE	*06*
NF	*07*
NG	*08*
NH	*09*
NI	*10*
NJ	*11*

Figure 6-6. Satellite Product Definition Block: Mode 3, Submode 30

NOTES: Figure 6-6 (Cont.)

Air Force DMSP S/C ID	NESDIS S/C ID for DMSP SATELLITES
8541	01
9543	02
0542	03

For DMSP satellites, NESDIS S/C ID is inserted in SATELLITE SERIES (word 3) and SATELLITE ID NUMBER (word 4).

3. START ORBIT - 4 Character ASCII.

For TOVS, use the Superswath number from first data record.

For DMSP, use the orbit number from the first data record.

4. END ORBIT NUMBER - 2 Character ASCII (numeric - modulo 100). Use Superswath number (or Orbit Number for DMSP) from last sounding record.

5. START TIME : DAY OF YEAR - Julian Day in two byte integer. Use start date from first sounding record.

6. START TIME : HOUR - One byte integer.

7. START TIME : MINUTE - One byte integer.

8. END TIME : HOUR - One byte integer from last sounding record.

9. END TIME : MINUTE - One byte integer from last sounding record.

Figure 6-6. (Cont.) Satellite Product Definition Block: Mode 3, Submode 30